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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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08/15/2006

Guy N. Pearson

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EXAMINER

HANSEN, JONATHAN M

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/589,499	Applicant(s) PEARSON ET AL.	
	Examiner JONATHAN M. HANSEN	Art Unit 2886	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 August 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>08/15/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because certain elements of Figure 1 are illegible. Specifically, FMCW Laser 2, EDFA 1, and Variable Fiber Delay 32 are difficult to locate because of the shading used in figures. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “separate ranging/Doppler sensor” of claim 6 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the

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drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Claims **2, 9, 11, 16, 18 and 19** are objected to because of the following informalities:

In regards to claim **2**, the claim is believed to have been intended to recite "the laser source comprises".

In regards to claim **9**, the claim is believed to have been intended to recite "the frequency modulation of the laser source".

In regards to claim **16**, the claim is believed to have been intended to recite "10 μ s or less".

In regards to claim **19**, the claim recites that it is dependent upon itself. However, the claim is believed to have been intended to recite a dependency from claim 17.

Claim **11** recites the limitation "the source". There is insufficient antecedent basis for this limitation in the claim. The claim should be amended to recite "the laser source".

Claim **18** recites the limitation "the initial step". There is insufficient antecedent basis for this limitation in the claim. The claim should be amended to recite "an initial step".

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims **1, 3-5, 12, 17 and 19** are rejected under 35 U.S.C. 102(b) as being anticipated by **US Patent 5,070,483 to Berni (cited by applicant)**.

In regards to claim **1**, Berni discloses and shows in Figure 4 below, a laser vibrometer comprising:

a frequency modulated laser source for producing a sensing beam (applicant's transmit beam) and a reference beam (applicant's local oscillator signal), both having the same frequency modulation (col. 7, ll. 36-49);

means for directing the transmit beam to a scene and receiving radiation reflected from the scene (col. 17, ll. 43-68);

a beam recombiner (applicant's mixing means) for mixing the received radiation with the local oscillator signal (col. 18, ll. 1-3); and

a detector for detecting frequency variations between the received and local oscillator signals (col. 18, ll. 10-13);

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wherein the vibrometer further comprises an optical delay for delaying the local oscillator for substantially the flight time of the received radiation (col. 8, ll. 60 to col. 9, ll. 11).

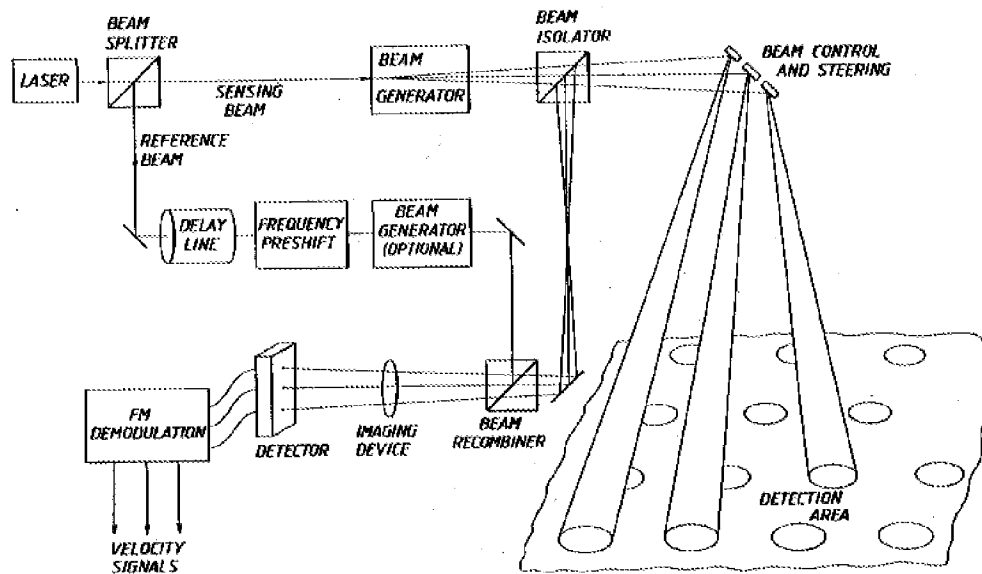


FIG. 4

In regards to claim 3, Berni discloses a laser vibrometer wherein the optical delay is a variable delay (col. 8, ll. 60 to col. 9, ll. 11).

In regards to claim 4, Berni discloses a laser vibrometer wherein the variable delay is a variable fiber optic delay line (col. 8, ll. 60 to col. 9, ll. 11).

In regards to claim 5, Berni discloses a laser vibrometer wherein the delay applied by the delay means compensates for any bulk Doppler effects (col. 20, ll. 23-47).

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In regards to claim **12**, Berni discloses a laser vibrometer wherein the means for directing the transmit beam to a scene and receiving radiation reflected from the scene transmits and receives radiation from a plurality of look directions (Figure 4).

In regards to claim **17**, Berni discloses a method of obtaining vibrometric data from a target comprising the steps of:

forming a transmit beam and a local oscillator signal from a frequency modulated continuous wave laser source (col. 9, ll. 47-53),

transmitting the transmit beam to a scene and receiving any radiation returned from the scene (col. 17, ll. 43-68),

delaying the local oscillator for substantially the flight time of the received radiation (col. 20, ll. 23-48), and

mixing the received radiation with the delayed local oscillator signal and detecting the frequency of the mixed signal (col. 10, ll. 36-54).

In regards to claim **19**, Berni discloses wherein the method comprises the step of processing the mixed signal to determine differential range and microDoppler information (col. 9, ll. 47 to col. 10, ll. 53).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims **6-8 and 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Berni**, in view of **US Patent 4,818,100 to Breen**.

In regards to claims **6-8**, Berni discloses setting a path length of a variable delay line to compensate for a time of flight of a sensing beam (col. 7, ll. 18-35 and col. 8, ll. 31-68).

He differs from the limitations in that he is silent to a laser vibrometer wherein the delay is determined by a separate ranging/Doppler sensor that is integral with the vibrometer; and

wherein the vibrometer is adapted to be operable in two modes, a first mode where bulk range and Doppler information is obtained and a second mode where the vibrometric image data is acquired.

However, Breen teaches a laser Doppler and time of flight measurement system and method that utilizes photodiodes (PD1 and PD2) to acquire time of flight data (col. 3, ll. 12-19)

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and a separate photomultiplier tube (82) to acquire Doppler shift information (col. 5, ll. 9-50).

Breen further discloses that the system can operate solely in either mode of operation (col. 2, ll. 20-29), wherein the time of flight measurements are done as an initial compensation or reorientation step to the Doppler measurements (col. 1, ll. 61-68 and col. 6, ll. 41-52).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Berni to include a separate ranging/Doppler sensor that is integral with the vibrometer; and wherein the vibrometer is adapted to be operable in two modes, a first mode where bulk range and Doppler information is obtained and a second mode where the vibrometric image data is acquired for the advantage reducing the cross-talk between the measurement signals, increasing the signal to noise ratio of each measurement and utilizing detectors that are tailored to each type of measurement.

In regards to claim **18**, Berni discloses setting a path length of a variable delay line to compensate for a time of flight of a sensing beam (col. 7, ll. 18-35 and col. 8, ll. 31-68).

He differs from the limitations in that he is silent to the method comprising an initial step of determining bulk range and Doppler information from the scene.

However, Breen teaches a laser Doppler and time of flight measurement system and method that utilizes photodiodes (PD1 and PD2) to acquire time of flight data (col. 3, ll. 12-19) and a separate photomultiplier tube (82) to acquire Doppler shift information (col. 5, ll. 9-50). Breen further discloses that the system can operate solely in either mode of operation (col. 2, ll. 20-29), wherein the time of flight measurements are done as an initial compensation or reorientation step to the Doppler measurements (col. 1, ll. 61-68 and col. 6, ll. 41-52).

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Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Berni to include an initial step of determining bulk range and Doppler information from the scene for the advantage of orienting or compensating the Doppler shift measurements to enable absolute measurements with a very high degree of precision (col. 1, ll. 35-40).

Claims **9-11** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Berni**, in view of **US Patent 5,127,731 to De Groot**.

In regards to claims **9-11**, Berni differs from the limitations in that he is silent a laser vibrometer wherein the laser source comprises a frequency stabilization means;

wherein the frequency stabilization means comprises means for identifying errors in the modulation and a modulator for correcting for said identified errors; and

wherein the output of the laser source is split into two portions, one portion being fed into an optical delay and another portion being fed into the means for identifying errors.

However, De Groot teaches a known technique for stabilizing the frequency of a laser source that utilizes an optical spectrum analyzer to sense variations in diode temperature through a measurement of the emission wavelength of the laser source, wherein a variation in temperature is directly related to the emission wavelength of the laser source. De Groot further discloses that control of the laser temperature is achieved by electronic feedback to the pump current of the laser (applicant's modulator). De Groot also shows in Figure 2 that the

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stabilization signal is branched off from the light source from a light path to an interferometer (applicant's optical delay).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Berni to include a frequency stabilization means; wherein the frequency stabilization means comprises means for identifying errors in the modulation and a modulator for correcting for said identified errors; and wherein the output of the laser source is split into two portions, one portion being fed into an optical delay and another portion being fed into the means for identifying errors for the advantage of improving the accuracy and sensitivity of the measurement system by removing source instabilities.

Claims **2, 12-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Berni**, in view of **US Patent 5,883,715 to Steinlechner et al (cited by applicant)**.

In regards to claims **2, 15 and 16**, Berni differs from the limitations in that he is silent to a laser vibrometer wherein the frequency modulation of the laser source comprises linear frequency ramps, and wherein the frequency modulation has a fast ramp time, wherein the ramp time is 10 μ s or less.

However, Steinlechner teaches a laser vibrometer that utilizes a frequency modulated laser source that has a triangular or saw-toothed (applicant's linear) frequency modulation (Figure 2), wherein the ramp time is illustrated as 1 μ s (Figure 2 and col. 4, ll. 33 for the value of f).

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Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Berni to include a linear frequency modulation and wherein the frequency modulation has a fast ramp time, wherein the ramp time is 10 μ s or less for the advantage of increasing the accuracy of the measurement system by removing errors associated with the laser source modulation.

In regards to claims **13 and 14**, Berni differs from the limitations in that he is silent to a laser vibrometer wherein the laser source has a wide bandwidth frequency modulation, of at least 1 GHz.

However, Steinlechner teaches a laser vibrometer that utilizes a frequency modulated light source having a modulated frequency of approximately 3 GHz (col. 3, ll. 55-65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Berni to include a wide bandwidth frequency modulation, of at least 1 GHz for the advantage of improving the range and sensitivity of the measurement system.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JONATHAN M. HANSEN whose telephone number is (571)270-1736. The examiner can normally be reached on Monday through Friday 9:30AM to 6:00PM EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tarifur Chowdhury can be reached on 571-272-2287. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JMH 03/24/2009

/TARIFUR R CHOWDHURY/
Supervisory Patent Examiner, Art Unit 2886